

## PROGRAMMABLE OPTICAL VECTOR MODULATOR AND METHOD FOR USE IN COHERENT OPTICAL COMMUNICATION

### ABSTRACT

A transmitter comprising a programmable optical vector modulator and method for coherent optical signal communication. The transmitter includes a transmitter laser whose output is coupled by way of an optical fiber to an amplitude modulator. The output of the amplitude modulator is coupled by way of a length of optical fiber to a phase modulator. The phase modulator generates a modulated light output from the transmitter. Amplitude modulation is achieved by inputting data and a data clock signal to amplitude symbol mapping logic whose outputs are selectively weighted, summed, amplified and input to the amplitude modulator to amplitude modulate the output of the transmitter laser. Phase modulation is achieved by inputting the modulating data and the data clock signal to phase angle symbol mapping logic whose outputs are selectively weighted, summed, amplified, delayed to synchronize with the arrival of the light from the amplitude modulator, and input to the phase modulator to phase modulate the amplitude modulated output of the transmitter laser. The programmability of the vector modulator allows the transmission of an M-ary modulation format that maximizes the data transmission for a given optical dynamic range and bit error rate target. Also, the programmability allows for rapid change in modulation format to maximize data transmission for changes in optical dynamic range and bit error rate target. The M-ary constellation may be predistorted to compensate for equipment piece part variation and fiber nonlinear effects; in particular the effect commonly known as "self-phase modulation".